

# Escuela de Farmacología “Teófilo Hernando”

Universidad Internacional Menéndez Pelayo (UIMP)

(XVI Summer “Teófilo Hernando’s” School of Pharmacology)

of the Menéndez Pelayo’s International University

## Understanding the Human Brain

(July 24-28, 2017, Santander, Spain)

**Directors:**

**Antonio G. García**

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Universidad Autónoma de Madrid

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Coordinator:

**Luis Gandía**

Instituto / Fundación Teófilo Hernando de I+D del Medicamento  
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You can find information regarding UIMP course in the following web pages

<http://www.uimp.es/>

<http://www.ifth.es/>

### **Fellowships:**

a) Directly at **UIMP**: From April 18<sup>th</sup>, 2017

b) At **Fundación Teófilo Hernando** (Arturo García de Diego; email

[arturo.garcia@ifth.es](mailto:arturo.garcia@ifth.es)): From June 15 to July 10 (after failure of UIMP application)

## DRAFT PROGRAMME

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### Monday, July 24:

- 10:00 Inauguration by UIMP authorities and School directors
- 10:30-12:00 ***The origin of the universe***  
Carlos Hernández-Monteagudo  
Centro de Estudios de Física del Cosmos de Aragón" (CEFCA), Teruel, Spain
- 12:00-13:30 ***Similarities between the universe and microscopic world of the brain: two parallel worlds?***  
Javier DeFelipe  
Instituto Cajal (CSIC) and Centro de Tecnología Biomédica (UPM), Madrid, Spain
- 15:00-17:00 **YRC-1.-Frontier drug discovery in brain diseases**  
Coordinator: Antonio G. García  
Universidad Autónoma de Madrid

### Tuesday, July 25

- 10:00-11:30 **Brain Research and computation– The wondrous voyage into ourselves**  
Idan Segev  
The Hebrew University, Jerusalem, Israel.
- 12:00-13:30 **Cerebral basis of cognitive function**  
Bryan Strange  
Centro de Tecnología Biomédica (UPM), Madrid, Spain
- 15:00-17:00 **YRC-2.- Frontier drug discovery in brain diseases**  
Coordinator: *Luis Gandía*  
Universidad Autónoma de Madrid; Spain

### Wednesday, July 26

- 10:00-11:30 **Neuromorphic computers**  
Karlheinz Meier  
Universität Heidelberg
- 12:00-13:30 **The Anatomical Problem Posed by Brain Complexity and Size: A Potential Solution**  
Javier DeFelipe  
Instituto Cajal (CSIC) and Centro de Tecnología Biomédica (UPM), Madrid, Spain

15:00 17:00 **YRC-3.- Frontier drug discovery in brain diseases**  
Coordinator: *Antonio G. García*  
Universidad Autónoma de Madrid; Spain

**Thursday, July 27**

10:00-11:30 **Localization in the brain: new solutions emerging**  
Jan G. Bjaalie  
Institute of Basic Medical Sciences, Oslo, Norway

12:00-13:30 **Reconstruction and simulation of neurocortical microcircuitry**  
Henry Markram  
Blue Brain Project; École Polytechnique Fédérale de Lausanne; Switzerland

15:00-17:00 **YRC-4.- Frontier drug discovery in brain diseases**  
Coordinator: *Luis Gandía*  
Universidad Autónoma de Madrid; Spain

**Friday, July 28**

10:00-11:30 **Frontier drug discovery in Alzheimer's disease**  
*Antonio G. García*  
Universidad Autónoma de Madrid; Spain

11:30-13:00 Closing Lecture: **Understanding brain diseases: *Alzheimer's disease***  
John Hardy  
Institute of Neurology, University College London, UK

13:00 Closing ceremony: UIMP authorities and School directors

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*Supporting institutions: Instituto-Fundación Teófilo Hernando de I+D del Medicamento (IFTH), Universidad Autónoma de Madrid, Spain*  
*YRC, Young Researcher Communications*

## Understanding the Human Brain

Our brain is the basis of our humanity, allowing us to perform extraordinary and highly complex tasks, such as writing a book, composing a symphony, or inventing ingenious machines like the computer. Alterations of the brain give rise to terrible and common diseases including Alzheimer's disease, Parkinson's disease, schizophrenia, etc. Thus, understanding the human brain is the ultimate goal but this is extremely challenging — not only because of its complexity and the technical difficulties involved, but also because ethical limitations do not allow all of the necessary datasets to be acquired directly from human brains. Consequently, most of our present knowledge of brain structure and behavior has been obtained from experimental animals. The problem is that data from nonhuman brains cannot fully substitute information on humans since there are fundamental structural and behavioral aspects that are unique to humans as well as to any other species. Accordingly, the question remains as to how much of this nonhuman brain information can be reliably extrapolated to humans, and indeed it is important to establish what the best strategy currently is for obtaining the missing data.

It seems clear that only by combining studies at molecular, cellular, systems, and behavioural organization levels can allow us to fully understand the structural arrangement of the brain as a whole. However, despite the fact that neuroscience has advanced spectacularly in recent decades from genetic, molecular, morphological and physiological perspectives, the question remains as to why we are still so pessimistic about adopting this kind of combined approach. The simple reason for this is that there are enormous gaps between each of these disciplines — gaps which remain practically unexplored. This is not an easy task as it requires cooperation not only between groups of neuroanatomists with expertise in different techniques, but also close collaboration between those with expertise in quite different areas, like specialists in image analysis, data analysis, theory neuroscience, computation, molecular biology, physiology, among others. This is where large international projects come into play, the idea being to pool the efforts of multiple laboratories with different areas of expertise — coordinated through big worldwide projects like the Human Brain Project (HBP) based in the European Union and the Brain Activity Map based in the United States. Thanks to these and other initiatives that promote interdisciplinary collaboration and data sharing, such as the Allen Institute for Brain Research or neuroinformatic platforms like NeuroMorpho.Org and

BAMS2 Workspace, the tempo of the development of new technologies and new strategies to study the brain can be extraordinarily increased giving us cause for optimism.

In this series of lectures, several neuroscientists who are experts in different fields of research, including some of the leaders of the HBP, will discuss major issues regarding the study of the human brain from different angles. We will also deal with some major neurodegenerative brain diseases and with frontier drug discovery to treat Alzheimer's disease, other neurodegenerative diseases and stroke.

## **FORMAT OF YOUNG RESEARCHER COMMUNICATIONS**

Young Researcher Communications (YRCs) are held every afternoon from Monday to Thursday. Every session consists in six 10-min communications followed by 5-min discussion presented by postdocs and PhD students on their own neuroscience work.

The session themes must be related with the course subject namely neuroscience, physiology, neurology, psychiatry and pharmacology of the CNS with a broad scope. It is convenient to put some emphasis in potential drug targets for specific diseases (this is a School of Pharmacology) although this is not a restrictive condition at all.

Registration and participation in the entire course is mandatory for the young scientists participating in these YRCs. The Teófilo Hernando's Foundation and UIMP will help with expenses on an individual basis. It is, however, desirable that some funds from the working institution of the postdocs and PhD students may be provided to cover some of the travel and local expenses at Santander.

## **ABOUT THE INTERNATIONAL UNIVERSITY "MENÉNDEZ PELAYO" (UIMP)**

UIMP was created on August 23, 1932 as a result of the approval of a foundational decree proposed by the Minister for Public Education and Arts, Fernando de los Rios. Courses started in 1933 under the leadership of Ramón Menéndez Pidal and Blas Cabrera from 1934 to 1936 and the poet Pedro Salinas as Secretary General. This could explain the strong emphasis in humanities and Spanish language courses as well as in political, economical and social sciences of UIMP. However, the summer programme has also traditionally hosted advanced courses in physics, chemistry, mathematics, medical and other sciences.

In the 1940s the University adopted its current name after Marcelino Menéndez Pelayo, a Spanish historian born in Santander, where the most traditional and famous campus of this University is located. The "Universidad Internacional Menéndez Pelayo" (UIMP) was created to foster a better relationship between professors and doctoral and postdoctoral students, during summer courses that lasted several weeks and at its earlier time, during the whole

summer. The idea was to create an informal atmosphere for discussion and analysis of different topics in the frontier of knowledge. This strongly contributed to the intellectual maturation of young students as well as to the development of a critical and liberal attitude toward problems and people, in an atmosphere of open spirit and intellectual relevance.

During the last decades UIMP has diversified the type of courses and activities, of short (few days, one week) and longer duration (weeks to months) and has recently established PhD programmes in collaboration with the National Research Council (CSIC) and other private and public institutions. Eighty years after its foundation, the UIMP is still a benchmark in the Spanish educational arena.

UIMP has different campuses throughout Spain and courses are held along the year. UIMP directly depends on the Spanish Ministry of Education that elects its Rector among renowned University Professors (For more information visit UIMP site at <http://www.uimp.es>).

### **SUMMER COURSES IN LA MAGDALENA PALACE**

The most famous campus of UIMP is La Magdalena Palace, located in Santander, North of Spain.



This palace was built at the beginning of the XX century and was gifted by the city of Santander to the Royal Family (Alfonso the XIIIth), for his summer vacations. This helped to develop Santander and its beaches and mountains surroundings, as one of the most beautiful tourist sites of Spain. In fact, Santander is actually considered as one of the most attractive cities of Spain due to the extraordinary combination of mountains, the Atlantic Ocean, the green and colourful gardens and the forests of Cantabria, the Autonomous Spanish Community having as capital Santander. Professors and students coming from abroad get unanimously astonished with the beauty of the Magdalena Palace, surrounded by forest, beaches (i.e. the famous “El Sardinero” beach) and beautiful and well kept colourful gardens where professors and students can gather together, in the lecture hall, at the restaurants or

walking in the surroundings of the palace and the Caballerizas, the place where the horses were kept at the time of the Royal family vacations, and now a residency and some lecture halls.

### **THE “TEÓFILO HERNANDO’S” SCHOOL OF PHARMACOLOGY: ORIGIN, DEVELOPMENT AND ACTIVITIES**

The Teófilo Hernando’s School of Pharmacology (THSP) was initiated in 1996, in the frame of the summer courses of the UIMP. At that time, Rector José Luis García Delgado invited professor Antonio G. García (Autonomous University of Madrid) to organise this School. The courses are held at the magnificent Palace of la Magdalena, located on top of a hill at the Peninsula of La Magdalena.

The format of a UIMP’s School (“Escuela”) is based in the critical analysis in the frontier of knowledge of a given scientific topic, along a week (Monday to Friday) by scientists and students of all over the world. Emphasis is always made in drug discovery and development as well in basic research that illuminate on the identification of new biological drug targets for treating disease. The THSP was named after Teófilo Hernando, a Spanish MD/PhD pharmacologist who was trained under Oswald Schmiedeberg at Strassbourg, the first formal Pharmacology School where many pharmacologists were trained at the beginning of the XX century and then developed the subject of basic and clinical pharmacology all over the world. Teófilo Hernando introduced pharmacology as an independent teaching and science subject at the Central University of Madrid, along the first four decades of the XX century. He trained numerous other disciples that extended the subject to many other Spanish universities along the XX century.

Since 1996, 15 editions of the THSP have been held. Over 100 internationally recognised scientist professors and over 500 students have since then attended the THSP. The subjects of the subsequent schools were as follows:

- 1.-Drugs and their receptors (1996)
- 2.-Drugs for the brain (1997)
- 3.-Clinical trials in Spain (2000)
- 4.-Biotechnological drugs (2001)
- 5.-Alzheimer’s disease (2002)
- 6.-Drugs and cardiovascular risk (2003)
- 7.-Chronic inflammation and osteoarthritis (2008)
- 8.-Neurodegenerative diseases (2009)
- 9.-The language of neurons (2010)
- 10.-Neuroprotection and neuroreparation of the injured brain (2011)
- 11.-New concepts and strategies for neuroprotection (2012)
- 12.-Brain damage and repair (2013)
- 13.-Frontier drug discovery in brain disease (2014)
- 14.-New therapeutic targets in brain disease (2015)

15.-Alzheimer's and other neurodegenerative diseases: Pharmaco-therapeutic advances (2016)